MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: June 13, 2006

SUBJECT: Sludge Conditioning Conveyor 5 Belt Turnover Stations

Please review and approve the recommendation for the sludge conditioning conveyor 5 stated below by signing at the bottom.

We recommend the elimination of the sludge conditioning conveyor 5 belt turnover stations. Fly ash accumulates around the bottom bearing of the vertical turnover pulleys. The accumulation of the fly ash causes the bearings to seize, which then cause the vertical pulleys and the belt to wear out.

We recommend that the turnover stations be replaced by snubber idler pulleys to support the belt where the current turnover stations are positioned. We recommend that this be done in July when maintenance will be replacing the sludge conditioning conveyor 5 belt.

The cost of completing this work will be approximately $17,500 and we estimate the present value of the savings from reduced maintenance to be $30,783 with a 2.6 year payback and a 43% rate of return (see attached economic analysis).

Please contact Dahl Dalton at extension 6475 with any questions.

______________________________________ ____________________

George W. Cross — Date

President and Chief Operations Officer

Attachments
DJD/JKH:jmj

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: September 20, 2006

SUBJECT: Bypass the Boiler Area Sump Pump Transfer Building.

Please review and approve the recommendation for the boiler area sump pump transfer building stated below by signing at the bottom.

Currently there are 4 Warman pumps in the boiler area sump pump transfer building. To keep the pumps running Maintenance overhauls one pump per year. The cost to refurbish one pump is approximately $20,000 to $30,000 depending on the repairs needed. The pumps have become very worn and will need to be completely replaced in the near future.

The boiler area sump pump transfer building would be bypassed as suggested in work order 03-89977-0. The water from the boiler area sump would be allowed to pass through the transfer building by overflowing into the overflow pipe located in the holding tank. The overflow pipe connects to a drainage ditch. This ditch runs to the settling basin pond. The settling basin pumps currently have the capability to be valved to pump the excess water to the bottom ash basin. The bottom ash basin is where the boiler area sump water is currently being pumped to by the transfer pumps.

There are two concerns with all of the boiler area sump water going to the settling basin. The first concern is the effect that the PH, hardness and alkalinity of the boiler area sump water would have on the scrubbers since the settling basin water is used for make up water in the scrubber units. A sample of the boiler area sump water was analyzed by the lab. The results are as follows:

	Hot	Room Temp
PH	9.95	9.91

Hardness	Total	1150
	Calcium	950
	Magnesium	200
Alkalinity	M	70
	P	52
	O	34

Based upon the results it was concluded that the boiler area sump water would not cause any issues for the scrubber modules.

The second concern is that the solids in the water would settle out in the settling basin pond where they would be difficult to remove. There is a weir in the ditch to skim oil from the water going into the settling basin. It appears that the weir would slow the velocity of the water down enough to let the solids settle out in the ditch where they can be easily removed from the ditch by bobcat or backhoe. The recommendation is to bypass the boiler area sump pump transfer building for 1 year on a trial basis. During this one year trial the effects on the scrubbers and settling basin will be closely monitored.

Work that needs to be completed before starting the trial is the cleaning of the drainage ditch. This will make it easier to closely monitor the amount of solids settling in the ditch and the frequency the ditch needs to be cleaned.

Please contact Dahl Dalton at extension 6475 with any questions.

George W. Cross
President and Chief Operations Officer

Date

Attachments
DJD/JKH:jmj

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Mike Alley

FROM: Dennis K. Killian

DATE: December 12, 2006

SUBJECT: Dust collector balancing, testing and follow up
IGS06-05, WO #06-86652-0

Thanks to the help and cooperation of Maintenance & Operations, Engineering was able to complete the work listed below for the dust collector capital project IGS06-05.

- Installation
  - Isolation valve
  - Accumulator filter
  - Heavy duty regulator

- Testing & inspection
  - Dye leak Testing
  - Expansion joint inspections
  - Hopper inspections

- Performance
  - Pickup point balancing
  - Exhaust fan vacuum optimization
  - Sealing pickup points

The work mentioned above was completed on the following dust collectors:

DC 1A - Coal car unload
DC 1B - Coal car unload
DC 1C - Coal car unload
DC 1D - Coal car unload
DC 2 - Coal truck unload
DC 3 - Coal reserve reclaim
DC 4 - Coal transfer 1
DC 5 - Coal transfer 2
DC 6 - Coal transfer 4
DC 11 - Coal crusher
DC 13A - Unit 1 east
DC 13B - Unit 1 west
DC 14A - Unit 2 east

DC 14B - Unit 2 west
DC LS1 - Limestone trk unload
DC LS2 - Limestone reclaim
DC LS3 - Limestone crusher
DC LS4 - Limestone prep

Dust collector 3 was not able to be properly balanced due to the high differential pressure in the hopper. This problem was resolved later and balancing will be completed on December 27th.

Any issues discovered during the testing & inspection were corrected immediately if possible. The issues that were fixed are listed below.

DC 1A
Replaced 2 worn out bags

DC 1B
Replaced 3 worn out bags

DC 1C
Replaced 1 worn out bag

DC 2
Replaced worn out exhaust fan expansion joint

DC 3
Guzzled the coal out of hopper and replaced broken shear pin

DC 5
Replaced 2 worn out damper gates

DC 6
Replaced 2 worn out damper gates and replaced 18 worn out bags

DC 14A
Replaced 3 broken wire bag cages and Replaced 3 shredded bags

DC 14B
Replaced 2 worn out bags

Those issues that were discovered during testing and inspection that were not able to be fixed and still need to be addressed are listed below.

DC 1A
Tighten seal on 3 explosion proof doors, weld 2 holes in bag house on the clean air side and replace bags around damaged bags that filled with coal dust.

DC 1B
Replace bags around damaged bags that filled with coal dust.

DC 1C
Replace bags around damaged bags that filled with coal dust.

DC 2
Replace 3 worn out pickup point expansion joints

DC 6
Install new designed baffle in hopper, replace 1 worn out pickup point expansion joint and replace missing door clamp on top of hopper.

DC 11
Replace missing door clamp on top of hopper.

DC 14A
Weld the 2 cracks in the cell plate

DC 14B
Weld the 4 cracks in the cell plate

DC LS2
Replace 2 worn out pickup point expansion joints

DC LS4
Replace 1 worn out pickup point expansion joint and clean limestone out of pickup point pipe.

The items listed above were reviewed with Kevin Ivie and Alan Dewsnup in Maintenance so these issues can be followed up and completely resolved.

An inspection of the water treatment lime DC 2 was also performed. When the inspection was performed the bags had just been changed and they were clean. The inspection found that the dust collector was not sized big enough to handle the air volume coming from the blower doing the material transfer. This causes the lime silo to over pressurize pushing material out the bottom and plugging the lime slakers.

This process produces steam from the exothermic reaction of combining lime with water. The moisture from the steam shortens the life of the bags by blinding them. As the bags become blinded the problem of over pressurizing the silo only become worse.

A Teflon coated bag would be better suited for this application than the regular polyester style bags. The Teflon bags resists blinding due to moisture. Maintenance has found a cheap supplier of Teflon coated bags making the cost differential very small.

I would also recommend using the Teflon coated bags for the other dust collectors due to the small differential cost and that it is impossible to completely seal the dust collectors from the ingress of water from wash downs.

Please notify Dahl Dalton at ext. 6475 if there are any questions.

DD:

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Jon A. Finlinson

FROM: Dennis K. Killian

DATE: February 20, 2007

SUBJECT: Nuclear Gauges on the Plant and Crusher Surge Hoppers

It recently became apparent during a routine walkdown of the site nuclear sources that the plant and crusher hopper low level switches have been out of service for quite some time. We recommend that the nuclear detectors on the plant and crusher surge hoppers be placed back in service to prevent premature erosion of the coal conveying equipment. Coal falling directly on the vibratory feeder pan can also cause excessive vibration and harmonics that can destroy the equipment.

The detectors on the surge hoppers have been placed out of service with the gates racked out in the open position. This is allowing the coal to flow freely through the hoppers.

The hoppers are designed to be full of coal. If the hoppers are empty, the coal is allowed to impact the bottom from a high distance, significantly increasing the erosion process. The high impact of the coal is currently causing high erosion of the hoppers, feeders and redlers.

If there are any issues with operating the system this way, please let us know so that we can resolve them. Mike Nuttal is currently working on the gate operators to make them more robust and failsafe.

Please notify Dahl Dalton at extension 6475 if there are any questions.

DJD/JKH:jmj
cc: Ken Lebbon
G. Mike Alley

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: May 15, 2007

SUBJECT: Sludge Conditioning Conveyor 4 Belt Turnover Stations

Please review and approve the recommendation for the Sludge Conditioning Conveyor 4 stated below by signing at the bottom.

We recommend the elimination of the sludge conditioning conveyor 4 belt turnover stations similar to what was done on sludge conditioning conveyor 5. Fly ash accumulates around the bottom bearing of the vertical turnover pulleys. The accumulation of the fly ash causes the bearings to seize, which then cause the vertical pulleys and the belt to wear out.

The same V-return idler pulleys that were used on sludge conveyor 5 would be used to support the belt where the current turnover stations are positioned. We recommend that this be done in July when maintenance will be replacing the sludge conditioning conveyor 4 belt.

The actual cost of removing the turnover stations on conveyor 5 was $18,778. The work scope to accomplish these modification on sludge conveyor 4 will be smaller than it was on conveyor 5. The estimated cost of modifying conveyor 4 would be approximately $17,700. The savings from reduced maintenance is estimated to be $30,509. From the attached economic analysis this shows a 2.7 year payback and a 41% rate of return.

Please contact Dahl Dalton at extension 6475 with any questions.

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George W. Cross Date
President and Chief Operations Officer

Attachments
DJD:jkh

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: May 21, 2007

SUBJECT: Sludge Conditioning Shuttle Carriages

Please review and approve the recommendation for the sludge conditioning shuttle carriages stated below by signing at the bottom.

Technical services recommends setting up the shuttle carriages in conditioned sludge transfer building 1 so that they can be moved between belts three and four while running without tripping the breakers on the shuttle carriages, as well as the belts feeding them. In addition, we also recommend programming in a few safety measures. For example, the emergency pull cables are not functioning at this time.

The reason for this recommendation is to give the operators the ability to transfer from belt four to the emergency feed-out without having to shut down and restart the belts.

Please contact Dahl Dalton at extension 6475 with any questions.

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George W. Cross Date
President and Chief Operations Officer

Attachments
ZWP:

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: August 7, 2007

SUBJECT: Drain Valves MBV-11 and MBV-12 on Bottom Ash Pipeline

Please review and approve the recommendation for the removal and replacement of MBV-11 and MBV-12 as discussed below by signing at the bottom.

Engineering recommends the removal of the valves and actuators used to open the drains located at the bend in the bottom ash pipeline near the bottom ash recycle basin. The actuators do not function, requiring the valves to be operated manually. Due to corrosion, buildup of material in the valve, and the nature of the valves themselves, manual operation is a difficult and time-consuming process.

Engineering recommends replacing these valves with ball valves, which will be easier to operate manually.

The estimated cost of replacing the nonfunctioning system with similar parts is $11,286. The cost of replacing the nonfunctioning system with manual ball valves will be approximately $8,909, saving an initial $2,377. An additional annual savings due to decreased maintenance cost will be approximately $2,469. This project will have a 2.6 year payback with a 40 percent rate of return.

Please contact Dahl Dalton at extension 6475 or Zach Peterson at extension 6630 with any questions.

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George W. Cross
President and Chief Operations Officer

Date

Attachments
ZWP/JKH:jmj

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Wes J. Bloomfield

DATE: December 24, 2007

SUBJECT: Hydrogen Generation System

Engineering has reviewed the economics of purchasing an on-site Hydrogen Generation System. We recommend that we do not purchase a new hydrogen generation system at this time. The economic analysis shows that the current hydrogen delivery system is the most cost effective method for cooling the generator.

Previously a hydrogen generator was installed on-site. The hydrogen generator was unreliable and expensive to operate. We currently get hydrogen delivered by tanker truck to our high pressure storage tanks. The hydrogen from this high pressure storage is used to make up the daily leak rate of the generator cooling system and recharge the generator casing when the generator has been purged. The hydrogen generation system would be sized to cover the daily leak rate only. The high pressure storage would still be used to recharge the generator casing when purged.

New technology has made on-site hydrogen generation a reliable and cost-effective means of cooling generators. The reason it is not economically feasible for us is that we get hydrogen delivered at an extremely low cost and we have a very low leak rate for the size of our generators. The economic analysis is very sensitive to the cost of the delivered hydrogen. If the cost of the supplied hydrogen should go up significantly and/or the leak rate should go up dramatically then this economic analysis should be reevaluated.

The cost of a hydrogen generation system is $175,935. The required hook ups are already in place from the previous system. The annual maintenance and operating cost are $11,000. Annual savings using worst case cost for delivered hydrogen is $31,846. From the attached economic analysis this shows an 8.4 year payback and an 11 percent rate of return (see attached economic analysis).

Please contact Dahl Dalton at extension 6475 with any questions.

DJD/JKH:jmj
Attachments

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Wes J. Bloomfield

FROM: Jon P. Christensen

DATE: October 19, 2010

SUBJECT: Repair of the Corroded Thickener Tanks

Engineering has completed an inspection of the inside and outside of the A Thickener Tank. Based on this inspection, we recommend that Maintenance budget to repair the B and C Thickener Tanks for the next budget cycle 2012-2013.

Currently the A Thickener is out of service which enabled Engineering to do the inspection on the tank. We found several areas inside and out where the coating has failed and the metal is severely corroded underneath (see attached pictures). The A thickener has been out of service for about 2.5 years which leads us to conclude that the B and C Thickener Tanks are in worse condition.

The Thickeners will need to have the dirt pulled away from the outside of the tanks and the coating on the inside and outside removed. The corroded metal will need to be weld repaired and then re-coated inside and out. We strongly recommend using Saurisen Fibercrete with abrasion resistant Cono-Glaze top coat to re-coat the inside and Duromar 4320 to re-coat the outside of the tanks instead of coal tar epoxy which was the original coating used.

Please contact Dahl Dalton at extension 6475 with any questions.

DJD/JKH:jmj

Attachments

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Wes J. Bloomfield

FROM: Jon P. Christensen

DATE: December 6, 2010

SUBJECT: Investigation of Using Alternative Materials for Replacement of Scrubber Drains Sump Pump Discharge Pipeline

Engineering has completed the investigation of using alternative materials for replacing the scrubber drains sump pump discharge pipelines. Based on the following economics of this investigation Engineering recommends replacing the Scrubber Drains Sump Pump Discharge Piping with steel (A106 GR-B) rubber-lined piping.

- Drisco Polyethylene Pipe - $10,680.80
- Ershigs Abrasion Resistant FRP Pipe - $19,961.24
- Steel A106B Rubber Lined Pipe - $ 4,860.00

The Current Scrubber Drains Sump Pump Discharge Piping is constructed of A53 carbon steel, 5-inch diameter, standard weight seamless pipe. The pipe has a 1/4-inch internal natural rubber lining making the ID with the rubber lining 4.547 inches. The pipe comes in 20-foot flanged sections. The rubber lining of the piping has bubbled, allowing it to tear. The degradation of the rubber lining is causing the steel pipe to become corroded, eroded, and plugged.

Engineering Investigated two alternative materials to the steel rubber lined piping as suggested in work order 10-10698-0. These materials are:

- Polyethylene
- Fiberglass Reinforced Plastic (FRP)

The original design parameters, listed in the scrubber solids system code ASE pipeline list, were used in selecting the pipe weight class\properties. The design parameters are:

- Pressure = 110 psi
- Temperature = 120°F

Based on these design parameters a Drisco SDR-11 4100 series polyethylene pipe and Ershigs Abrasion Resistant Stopline G-2 110A FRP pipe were selected to compare economically to the A106 GR-B standard weight seamless steel rubber lined pipe.

The economic comparison is based on the following criteria:

Specific Gravity of Slurry = 1.13

Specific gravity is used to calculate the slurry density which is essential in determining the span of the piping supports.

Internal Diameter = 4.5 inches

The size of the internal diameter directly affects the designed transport velocity of the system. Maintaining the design velocity is critical in keeping particles suspended and pipeline erosion down.

Flanged Piping Connections

The flanged connections allow for the line to be easily separated. This access is important in being able to clean plugs out of the lines.

Coefficient of Linear Expansion

- Polyethylene = 1.2×10^{-4} in/in·°F
- FRP = 2.1×10^{-5} in/in·°F
- Steel = 7.3×10^{-6} in/in·°F

The thermal expansion rate of the material directly affects the number of expansion joints needed in the system. The expansion joints accommodate the movement in the pipeline keeping stresses in the pipe to an acceptable minimum level.

Based on the specific gravity of the slurry and the design temperature of 120°F, Drisco recommended supporting their pipe every six to seven feet and Ershigs recommended supporting their pipe every 12-12.5 feet. The current span for the majority of the piping supports is 12-13 feet. There are a few supports that have a six-foot span. The Drisco piping will need to have piping supports installed between each 12-13 foot span piping support.

The number of expansion joints were calculated based on a total pipeline length of 360 feet, the coefficient of linear expansion of each material listed above, and the following assumption:

- $\Delta T = 75$°F
- Maximum Movement of Expansion Joint = 2.5 inches

Based on the information above the number of expansion joints required for each type of pipe material is:

- Steel Requires - 1 Expansion Joint
- Polyethylene Requires - 16 Expansion Joints
- FRP Requires - 3 Expansion Joints

Using the number of expansion joints required for the steel pipe as a baseline, the Drisco piping will require 15 additional expansion joints and Ershigs Piping will require two additional expansion joints.

For the detailed expansion joint calculations refer to attachment A.

These data were used to calculate the total project material cost for each type of piping selected. The material project costs of the three types of piping are:

- Drisco Polyethylene Pipe - $10,680.80
- Ershigs Abrasion Resistant FRP Pipe - $19,961.24
- Steel A106B Rubber Lined Pipe - $ 4,860.00

For the detailed economic evaluation calculations refer to attachment B.

Based on the economic evaluation and the performance over the past 24 years of the steel rubber-lined piping, Engineering cannot recommend using alternative materials to replace the existing scrubber drain sump pump discharge piping. Engineering recommends replacing the existing A53 standard weight seamless steel rubber lined piping with A106 GR-B standard weight seamless steel rubber lined piping. The two steel materials are very similar but the A106 has a little higher temperature rating and is more common and readily available.

DJD/JKH:jmj

Attachments

cc: R. Scott Robison

Attachment A

Equation - 1: $\Delta L = \alpha \times C_f \times L_o \times \Delta T$

Variables - ΔL - Change in Length
α - Coefficient of Linear Expansion for Each Material
C_f - Conversion Factor = 12in/1ft
L_o - Total Initial Length of Pipeline = 360ft
ΔT - Change in Temperature = 75°F

Equation - 2: $E_j^{\#} = \Delta L / M_m$

Variables - $E_j^{\#}$ - Number of Expansion Joints Required
ΔL - Change in Length
M_m - Maximum Movement of the Expansion Joint = 2.5in

Steel $\alpha = 7.3 \times 10^{-6}$ in/in•°F

Equation - 1 $\Delta L = 7.3 \times 10^{-6}$ in/in•°F×12in/1ft×360ft×75°F

$\Delta L = 2.4$ in

Equation - 2 $E_j^{\#} = 2.4\text{in} / 2.5\text{in}$

$E_j^{\#} = 0.96$ **1 - Expansion Joint Required** * Baseline

Polyethylene $\alpha = 1.2 \times 10^{-4}$ in/in•°F

Equation - 1 $\Delta L = 1.2 \times 10^{-4}$ in/in•°F×12in/1ft×360ft×75°F

$\Delta L = 38.9$ in

Equation - 2 $E_j^{\#} = 38.9\text{in} / 2.5\text{in}$

$E_j^{\#} = 15.6$ **16 - Expansion Joint Required**

FRP $\alpha = 2.1 \times 10^{-5}$ in/in•°F

Equation - 1 $\Delta L = 2.1 \times 10^{-5}$ in/in•°F×12in/1ft×360ft×75°F

$\Delta L = 6.8$ in

Equation - 2 $E_j^{\#} = 6.8\text{in} / 2.5\text{in}$

$E_j^{\#} = 2.7$ **3 - Expansion Joint Required**

Attachment B

Drisco Polyethylene Pipe

ITEM	DESCRIPTION	COST		QTY.	TOTAL COST
Pipe	5"Ø DR 11 Drisco 4100 Series Pipe ID 4.49" 40ft Sections	$6.00	/ft	360	$2,160.00
Flange	Steel Slide on Flanges	$75.00	ea	18	$1,350.00
Ring	Flange Retention Ring	$15.00	ea	18	$270.00
Additional Pipe Supports	Angle A36 4"X4"X½" 2.5ft/ea	$7.35	/ft	50	$367.50
Additional Pipe Supports	Pipe A106B 3"Ø Sch 40 2ft/ea	$10.06	/ft	40	$402.40
Additional Pipe Supports	Plate A36 ½" Thick 1sq.ft/ea	$11.85	/sq.ft	20	$237.00
Additional Pipe Supports	Hilti Concrete Anchor Bolts 4bolts/ea	$0.93	ea	80	$74.40
Additional Pipe Supports	5"Ø U-Bolts 2U-bolts/ea	$5.88	ea	40	$235.20
Additional Expansion Joints		$215.62	ea	15	$3,234.30
Shipping	From Canada				$2,350.00

Total Project Material Cost- $10,680.80

Ershigs Abrasion Resistant FRP Pipe

ITEM	DESCRIPTION	COST		QTY.	TOTAL COST
Pipe	AR Pipe System ID 4.5" 40ft Sections	$35.00	/ft	360	$12,600.00
Flange	Drilled	$385.00	ea	18	$6,930.00
Additional Pipe Supports	Not Required				$0.00
Additional Expansion Joints		$215.62	ea	2	$431.24
Shipping	Not included				$0.00

Total Project Material Cost- $19,961.24

Steel Rubber Lined Pipe

ITEM	DESCRIPTION	COST		QTY.	TOTAL COST
Pipe	Steel Rubber Lined 5"Ø A106B Sch 40 Seamless Pipe ID 4.55" 20ft Sections	$13.50	/ft	360	$4,860.00
Flange	Included				$0.00
Ring	Not Required				$0.00
Additional Pipe Supports	Not Required				$0.00
Additional Expansion Joints	Not Required				$0.00
Shipping	Included				$0.00

Total Project Material Cost- $4,860.00

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